AF 2831
#14/Appeal Brief
D.EVANS
10.10.02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of: **Knuth Albertsen et al**	Group Art Unit: **2831**
Serial No. **09/807,687**	Examiner: **N. T. Ha**
Filed: **April 16, 2001**	Attorney Docket No.: **PHD 99,105**
For: **Passive Component with Composite**	

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Assistant Commissioner for Patents, Washington, D.C. 20231

On: October 1, 2002

By: John C Fox

Assistant Commissioner for Patents
Washington, DC 20231

BRIEF OF APPELLANT

This is an appeal from the decision dated April 18, 2002 of the Examiner finally rejecting claims 1-12 of the application. A petition for a one-month extension to respond to the Final Office Action and a Notice of Appeal were mailed on August 1, 2002.

All requisite fees set forth in 37 CFR 1.17(c) for this Brief are hereby authorized to be charged to Deposit Account No. 501850.

REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee of all rights in and to the subject application, United States Philips Corporation, a Delaware Corporation whose ultimate parent corporation is Koninklijke Philips Electronics, N.V. of The Netherlands.

RELATED APPEALS AND INTERFERENCES

To the best of the knowledge of the undersigned, no other appeals or interferences are known to Appellants, Appellants' legal representatives, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Original claims 1-12, which stand finally rejected as set forth in the Office Action mailed April 18, 2002, are the subject of this appeal.

STATUS OF AMENDMENTS

No amendment to the specification and/or claims was offered subsequent to the final Office Action mailed April 18, 2002. All amendments have been entered.

SUMMARY OF THE INVENTION

The invention relates to a passive electronic component, for example, a multilayer component, comprising a dielectric and at least one electrode. (page 1, lines 1, 2).

Examples of passive electronic components are capacitors, antennas, actuators, and varistors. Of such components manufactured in multilayer form, capacitors are manufactured in the greatest quantities. (page 1, lines 3-5).

Such multilayer components are usually manufactured by laying up green ceramic substrate foils alternating with layers of a metal paste, whereupon the stack of ceramic and metal layers is sintered. (page 1, lines 6-9).

Sintering is carried out for the purpose strengthening the ceramic material. This leads to shrinkage, i.e. a density increase in the material, the extent of which will depend on the nature of the material, the particle size distribution of the basic powder, and the reaction conditions (sintering temperature, sintering time, sintering atmosphere).(page 2, lines 13-17).

The sintering atmosphere determines whether various mutually opposed oxidation and reduction reactions take place during sintering, which can affect the physical properties of the sintered ceramic. For example, barium titanate and its derivatives become semiconducting during sintering in a reducing atmosphere, and are thus unsuitable for use as dielectrics in passive components. The composition of the electrode material can also be affected by the sintering atmosphere. For example, sintering under oxidizing conditions will oxidize the electrode

material unless it consists of a noble metal such as rhodium, palladium, or platinum. Rhodium and platinum, however, are very expensive, and may account for up to 50% of the total cost. The tendency is to use much cheaper metals such as Ni, Cu, Ag, or alloys thereof. These metals, however, oxidize when sintered under oxidizing conditions. (page 1, lines 10-22).

There is a particular demand in the telecommunications industry for passive components which combine ceramic materials with cheaper metals: for example, nickel, copper and silver, as temperature-stable NP0 materials; copper, silver, gold and aluminum, for their low values of internal resistance which render possible their use at higher frequencies, in particular silver, for it's skin effect at frequencies above 500 MHz. (page 1, lines 23-29).

A reduction of the sintering temperature to below 900°C, which renders possible the use of silver as electrodes, is problematic because it may result in unintended chemical reactions between the various phases of the ceramic materials. For example, the reaction of high melting point phases with low melting point compounds such as highly reactive glasses. This in its turn may lead to undesirable changes in the physical properties of the sintered ceramic, such as the temperature specification. (page 2, lines 3-7).

According to the invention, the above problems are largely or completely avoided by employing a polymer to provide the needed mechanical strength for the ceramic dielectric. For example, a monomer is mixed with the ceramic material prior to forming, and the monomer is subsequently polymerized. This enables the use of cheaper electrode materials, which have the desired electrical properties.

According to one aspect of the invention, there is provided an electronic component with a dielectric and at least one electrode, characterized in that the dielectric comprises a composite consisting of a dielectric ceramic material and an organic polymer. (page 2, lines 10-12).

According to another aspect of the invention, there is provided a method of strengthening a dielectric without sintering, by first mixing the dielectric material with a monomer of a suitable polymer, whereupon the monomer is polymerized. (page 2, lines 17-20).

Preferably, the organic polymer is insoluble in water. The use of a water-insoluble polymer prevents changes in the properties and shape of the passive component and/or the dielectric which could be caused by the penetration of moisture. (page 2, lines 21-24).

It is furthermore preferred that the polymer comprises a polyimide, polyethylene, polycarbonate, or polyurethane. These polymers wet the dielectric ceramic material and are all insoluble in water. (page 2, lines 25-28).

In accordance with the method of the invention, an electronic component with a dielectric and at least two electrodes is manufactured by the steps of:

- mixing together the dielectric ceramic material and a monomer of a polymer,
- forming the mass obtained,
- partly or completely polymerizing the monomer, and
- providing the electrodes.

A second polymerization step may be carried out after the electrodes have been provided. (page 3, lines 8-16).

The polymerization of the monomer is thermally initiated by means of temperatures below 400 °C. (page 4, lines 1 and 2).

The dielectric constant ε can be adjusted to a desired value by means of the mixing ratio of dielectric ceramic material and polymer in the composite material. (page 4, lines 8 and 9).

The invention also relates to a dielectric ceramic compound which comprises a composite of a dielectric ceramic material and an organic polymer. (page 4, lines 10 and 11).

The invention further relates to a filter arrangement with an electronic component which comprises a dielectric and at least two electrodes, wherein the dielectric comprises a composite of a dielectric ceramic material and an organic polymer. (page 4, lines 17-19).

ISSUES

1. Are claims 1-11 anticipated under 35 USC 102(b) by Hansen et al (US Patent No. 5,889,647) (herein "Hansen et al")?

2. Is claim 12 anticipated under 35 USC 102(b) by Hirai et al (US Patent No. 5,448,209) (herein "Hirai et al")?

GROUPING OF CLAIMS

Claims 1-11 stand or fall together, and claim 12 stands or falls alone.

ARGUMENT

1. Are claims 1-11 anticipated under 35 USC 102(b) by Hansen et al (US Patent No. 5,889,647) (herein "Hansen et al")?

Claims 1-11 stand finally rejected under 35 USC 102(b) as being anticipated by Hansen et al. The Examiner stated that the reference teaches a composite ceramic dielectric comprised of a ceramic material, disclosed at col. 3, lines 47-50, and an organic polymer, disclosed at col. 4, lines 26-31.

At col. 4, beginning at line 19, Hansen et al describe a "customary method" of forming the "green body" for a multilayer ceramic capacitor. First, a suspension is formed of calcined ceramic powder, solvents, binders, softeners and dispersing aids. For the binders, a list of organic polymers is provided (lines 25-27).

The suspension is poured onto a moving surface. After evaporation of the solvent, a ceramic foil remains, which is then cut and printed with a metal paste. (lines 34-38).

Laminates are then formed and cut into individual capacitors. The capacitors are first sintered in a slightly reducing atmosphere at a temperature between 1100 and 1400 degrees C, whereafter they are "tempered" in a slightly

oxidizing atmosphere between 600 and 1100 degrees C. (lines 42-46).

Although not specifically stated by the reference, it is well-known that the binders used are temporary binders, which are volatilized and driven off during sintering, leaving only inorganic ceramic material behind.

As evidence that the temporary role of such organic binders in the production of ceramics is well known, a print-out from a web page of **Koyo Thermo Systems**, a furnace manufacturer, was provided to the Examiner during prosecution. The print-out includes a description of the role of binders in ceramics production. In the section entitled **Debinding, Decarbonization** it is stated (near the top of page 1)

"The green body contains beside the ceramic powder normally also moisture and organic binders. … all organic materials, which are volatile, ... have to be removed from the ceramic green body."

Since Hansen et al clearly teach that the organic polymers are used as binders for the formation of green ceramic foils, it would be clearly understood by the skilled artisan that such binders would be driven off during sintering at 1100 to 1400 degrees C. Accordingly, Hansen et al do not teach a

composite ceramic body of a ceramic dielectric and an organic polymer.

In contrast to the teachings of Hansen et al., Appellants teach the incorporation of an organic polymer into a ceramic dielectric body, thus eliminating the need for sintering. In fact, the skilled artisan would understand that heating Appellants' body at customary sintering temperatures would eliminate the organic polymer from the body.

Appellants heat their composite body at a much lower temperature, eg, below 400 degrees C, to initiate polymerization. Such a temperature is known to be below that required to break down or volatilize and drive off the organic material.

Accordingly, Hansen et al do not anticipate Claims 1-11, and it is urged that the rejection be reversed.

2. <u>Is claim 12 anticipated under 35 USC 102(b) by Hirai et al (US Patent No. 5,448,209) (herein "Hirai et al")?</u>

Claim 12 stands finally rejected under 35 USC 102(b) as being anticipated by Hirai et al. The Examiner cited col. 8,

lines 20-22 for the proposition that the filter of Hirai et al contains organic polymer.

However, like Hansen et al, Hirai et al teaches adding organic polymer as a binder to form a green sheet of ceramic powder (col. 8, lines 22-24). The green sheet is subsequently formed into a stack and fired at 900 degrees C. (col. 8, line 33), a temperature sufficient to drive off the binder.

Accordingly, Hirai et al do not teach a filter of a ceramic and and organic polymer, and do not anticipate claim 12, and it is urged that the rejection be reversed.

CONCLUSION

It has been shown that the claimed invention distinguishes over the express and implied teachings of the applied references. Hence, Appellants respectfully request that the Board reverse the Examiner's final rejection and direct that the application proceed to issue.

Respectfully submitted,

John C. Fox

John C. Fox
Consulting Patent Attorney
Reg. No. 24975

APPENDIX A

CLAIMS ON APPEAL

1. An electronic component with a dielectric and at least one electrode, characterized in that the dielectric comprises a composite consisting of a dielectric ceramic material and an organic polymer.

2. An electronic component as claimed in claim 1, characterized in that the organic polymer is insoluble in water.

3. An electronic component as claimed in claim 1, characterized in that the polymer comprises a polyimide, polyethylene, polycarbonate, or polyurethane.

4. An electronic component as claimed in claim 1, characterized in that the dielectric ceramic material has a low temperature coefficient.

5. An electronic component as claimed in claim 1, characterized in that the electrodes comprise Ag, Au, Cu, Al, or alloys of these metals.

6. An electronic component as claimed in claim 1, characterized in that the electronic component is chosen from the group comprising capacitors, antennas, actuators, and varistors.

7. A method of manufacturing an electronic component with a dielectric and at least two electrodes, which method is characterized in that

- the dielectric ceramic material and a monomer of a polymer are mixed together,
- the mass obtained is formed,
- the monomer is partly or completely polymerized, and
- the electrodes are provided.

8. A method as claimed in claim 7, characterized in that a second polymerization step is carried out after the electrodes have been provided.

9. A method as claimed in claims 7 and 8, characterized in that the polymerization is thermally initiated.

10. A method as claimed in claims 7 and 8, characterized in that the quantity m of monomer used lies between 3% by weight $\leq m \leq$ 20% by weight in relation to the quantity of dielectric ceramic material used.

11. A dielectric ceramic compound, characterized in that it comprises a composite of a dielectric ceramic material and an organic polymer.

12. A filter arrangement with an electronic component which comprises a dielectric and at least two electrodes, characterized in that the dielectric comprises a composite of a dielectric ceramic material and an organic polymer.